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Medicare Quality Monitoring System (MQMS) Report:

Heart Failure, 1992–2001

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ACKNOWLEDGMENTS AND DISCLAIMER

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Opinions and interpretations expressed herein are not necessarily the position of CMS or any other federal agency.

ABOUT MQMS

BACKGROUND

The Medicare Quality Monitoring System (MQMS) is an ongoing system that processes, analyzes, interprets and disseminates health related data to monitor the quality of care delivered to Medicare fee-for-service beneficiaries. The MQMS was initiated to provide useful information to the CMS PROs (Peer Review Organizations, currently renamed as Quality Improvement Organizations) program and has been evolved to address growing public concerns over quality of care, patient safety, provider accountability and patient choice. It is directed by the Centers for Medicare & Medicaid Services (CMS) with assistance from its contractors. MQMS development and production involves a diverse group of CMS staff, including program managers, clinical area team leaders (clinicians), epidemiologists, statisticians, and data analysts in the central and regional offices. CMS also consulted with leading experts in other federal agencies—such as the Agency for Health Care Research and Quality, the Centers for Disease Control—and in quality improvement organizations and academia.

INTENDED USE OF THE MQMS DATA

The MQMS is designed with the intention to support data-driven decision-making regarding quality improvement and payment/coverage policymaking. Development and production of the 2003 MQMS measures and respective methodologies were primarily aiming at providing input for broad and high-level policy making and program planning within CMS.

The 2003 MQMS **describes** trends, patterns, and variations in health status, disease- and procedure-specific utilization, outcomes and process of care at the national and state level that are related to CMS quality improvement program and initiatives, patient safety and payment/coverage policies. Without further analysis and manipulation of the data, the 2003 MQMS data are **inadequate to explain the specific causes of** the trends, patterns, and variations.

In addition to CMS internal use, MQMS provides data on Medicare quality of care for the AHRQ National Healthcare Quality Report (NHQR) and National Healthcare Disparities Report (NHDR).

- Specifically the MQMS data are to be used for:
    - Identifying potential quality problems
    - Tracking program implementation

  - Suggesting project ideas for quality improvement program
  - Targeting interventions
  - Prioritizing activities & allocation of resources
  - Focusing on a particular problem
  - Raising research questions/hypothesis for further investigation

- Further well-deliberated multivariate analysis is required for the MQMS data to be meaningful and useful for:

  - Drawing conclusions on cause-effect association between the QIOs process of care measures with the MQMS outcome measures
  - Evaluating individual QIO, providers in a state or state performance
  - Evaluating directly the effectiveness of the QIO program and other CMS quality improvement initiatives and payment/coverage policies

POPULATION AND HEALTH ISSUES EXAMINED

The population under study consists of Medicare fee-for-service (FFS) beneficiaries. MQMS is limited to FFS beneficiaries because of the current unavailability of encounter data from Medicare managed care plans. The MQMS 2003 edition monitors the following types of quality measures:

- Mortality and readmission rates, length of stay, and cost of hospitalizations for three conditions —acute myocardial infarction (AMI), heart failure and stroke
- Process of care and progression of diseases for diabetes
- Mortality and readmission rates following cancer-related and cardiac-related high-risk surgical procedures
- Patient safety
- Preventable hospitalization

METHODS

The 2003 MQMS analysis is limited to the national and/or state level, presenting longitudinal and/or cross-sectional descriptive statistics for various demographic and geographic subgroups. The results of MQMS 2003 edition are age-sex adjusted and not risk adjusted. The age-sex adjustment eliminates state-to-state and year-to-year variations in the age and sex composition but not the comorbidities or severity of illness of the

population. The age-sex adjusted data preclude interpretation alluding to state or provider performance.

MQMS results are based on data from all fee-for-service beneficiaries and claims, rather than a sample of such beneficiaries and claims. This means that the rates presented in MQMS reports do not contain sampling error. MQMS rates are not presented with confidence intervals or significance testing, since these intervals and tests are based on properties of sampling error. This approach implies that the FFS population is not interpreted as a sample drawn from a super-population, such as all Medicare beneficiaries or FFS beneficiaries from another time period. The one exception is the MQMS diabetes results, which are based on a five percent sample of full-year fee-for-service Medicare beneficiaries. Thus, rates presented in the MQMS diabetes reports are subject to sampling error, and confidence intervals or significance testing are presented.

MQMS results are subject to measurement error in the CMS Denominator File and MedPAR database, as well as to modeling error resulting form the age-sex adjustment. CMS continues to investigate the magnitude of these errors.

PRODUCTS

The MQMS products are a series of reports on quality measures, a set of tables on CMS' web site, plus the data files at the person and aggregate level used to generate the reports and documentation of the methodology and data processing. The reports are available on the CMS website; the data files and documentation reside on the CMS mainframe. To facilitate the use of the data and replication of the analysis, CMS makes available SAS programs and data processing documentation. Access to the data can be granted to CMS analysts on request. Other federal agencies and CMS contractors may obtain the data through a formal data request process.

MQMS 2003 reports include:

- MQMS Report: Beneficiary Characteristics and Utilization, 1992-2001
- MQMS Report: Acute Myocardial Infarction (AMI), 1992-2001
- MQMS Report: Patient Safety, 2000 and 2001
- MQMS Report: Heart Failure, 1992-2001
- MQMS Report: Preventable Hospitalizations, 1995-2001
- MQMS Report: Stroke, 1992-2001
- MQMS Report: Cancer-Related High-risk Surgeries I, 1992-2001
- MQMS Report: Cardiac-Related High-risk Surgeries II, 1992-2001
- MQMS Report: Diabetes, 1992-2001

EXECUTIVE SUMMARY

This report summarizes trends and variation in the hospitalization of Medicare beneficiaries for heart failure. The report describes discharge rates, length of stay, cost, readmission, and mortality from 1992 to 2001. It tracks utilization and outcome measures for the heart failure population as a whole and by demographic subgroup over the study period. Intended as one component of a surveillance effort, the report highlights recent trends and possible changes in trends in the care of heart failure patients. It also points to geographic or demographic differences in utilization and mortality of beneficiaries hospitalized for heart failure. The report addresses three specific questions:

- What are the characteristics of the Medicare beneficiaries hospitalized for heart failure and how similar is this population to the general Medicare FFS population?

- What are the trends and variation in hospitalization for heart failure in the Medicare FFS population and how do these trends differ by region and demographic group?

- What are the trends and variation in readmission and mortality after heart failure hospitalization over varying time periods after initial discharge?

Characteristics of the Heart Failure Population

- Medicare FFS beneficiaries hospitalized for heart failure in 2001 were predominately age 75 and above, female, white, and living in the South and Northeast.

- Compared with the distribution of the entire FFS population, heart failure beneficiaries were disproportionately older, female, black, dually eligible for Medicaid, and living in the South.

- Compared with the general FFS population, heart failure beneficiaries were twice as likely to be dually eligible and half as likely to qualify for Medicare as the disabled.

Hospitalization, Length of Stay, and Expenditures for Heart Failure

- Age-sex–adjusted rates of discharge for heart failure—the most common reason for hospitalization among Medicare FFS beneficiaries—were almost constant between 1992 and 2001.

- Heart failure discharge rates were highest among older age groups, males, blacks, dually eligible beneficiaries, ESRD beneficiaries, and beneficiaries living in the South.

- Heart failure discharge rates varied from state to state and from region to region, with the highest discharge rates in the South and the lowest rates in the West.

- Average length of stay for heart failure hospitalizations declined by over 20 percent from 1992 to 2001, leveling off at a little less than six days per stay. Length of stay was similar to the average length of stay for all Medicare hospitalizations.

Hospital Readmission among Heart Failure Beneficiaries

- Within one month of discharge, about 9 percent of beneficiaries hospitalized for heart failure were readmitted for heart failure, and after one year, 38 percent were readmitted. Rates for readmission for all causes were much higher (25 percent after one month and 74 percent after one year).

- The study period saw little progress in reducing readmissions rates following heart failure. While one-year heart failure readmissions declined slightly, rates of 30-day heart failure readmissions and all-cause readmissions (30-day and one-year rates) increased.

- Nonwhites registered slightly higher rates of heart failure readmission and experienced larger increases in heart failure readmission rates than whites.

- Readmission rates showed wide state-to-state variation; regional patterns were similar to those of discharge rates, with lower readmissions in the West.

Mortality among Heart Failure Beneficiaries

- In 2000, close to 8 percent of beneficiaries hospitalized for heart failure died within one month and a little less than one-third died within a year.

- Mortality following heart failure hospitalization declined modestly over the period. One-month mortality rates showed greater declines than one-year rates.

- While nonwhites had higher discharge and readmission rates for heart failure than whites, they had lower mortality rates.

- States with lower short-term readmission rates appeared to have higher short-term mortality rates. This relationship was not apparent after one year.

There was very little decline in discharge rates or readmission rates for heart failure over the ten year period of study, while there was some decline in mortality rates. These results suggest an increasingly frail population of Medicare beneficiaries in need of appropriate outpatient and inpatient management for heart failure. The findings of racial differences in readmission and mortality, state variation in outcomes, and a pattern of states with relatively high rates of readmission but low rates of mortality are interesting avenues for further research. Interpretation of these patterns will require controlling for differences in comorbidities, severity of illness, the availability of outpatient management for heart failure, and provider characteristics across these subgroups.

MEDICARE QUALITY MONITORING SYSTEM (MQMS) REPORT:

HEART FAILURE, 1992–2001

I. INTRODUCTION

Cardiovascular disease accounts for more deaths in the United States than any other single cause. Heart failure—the inability of the heart to pump sufficient blood to the body—is the leading cause of hospitalization among Medicare beneficiaries (Mathematica Policy Research 2003b). Heart failure is also a chronic disease, for which appropriate outpatient management can reduce rehospitalizations (AHRQ 2001). Common risk factors for heart failure include previous heart attacks and high blood pressure (American Heart Association 2002). In 2001, over one-half million beneficiaries were hospitalized at least once for heart failure, and Medicare spent over $4 billion on hospital care alone for heart failure.

This report uses data from the Medicare Quality Monitoring System (MQMS) to study trends and variations in heart failure discharges, readmissions, and mortality among Medicare fee-for-service beneficiaries from 1992 through 2001. Other MQMS reports will provide information on the other four Clinical Priority Areas in the Health Care Quality Improvement Project (HCQIP): acute myocardial infarction, diabetes, pneumonia, and stroke. During the 1990s, CMS increased its efforts to improve the quality of care for beneficiaries hospitalized with these conditions. In 1999, CMS began evaluating the Quality Improvement Organizations (QIO) on inpatient quality indicators for each condition. CMS chose these diagnoses because (1) they are common in the Medicare population and (2) effective interventions have been shown to reduce disability and mortality. All five were projects under the Sixth Scope of Work for Medicare QIOs.

As part of the HCQIP, the National Heart Failure Project is examining four inpatient quality indicators for heart failure: (1) assessment of left ventricular function (LVF); (2) angiotensin converting enzyme inhibitor (ACEI) use for patients with left ventricular systolic dysfunction; (3) post-discharge instructions, such as activity level, diet, discharge medications, follow-up appointment, weight monitoring, and what to do if symptoms

worsen; and (4) smoking cessation advice and counseling for patients with a history of smoking.[1]

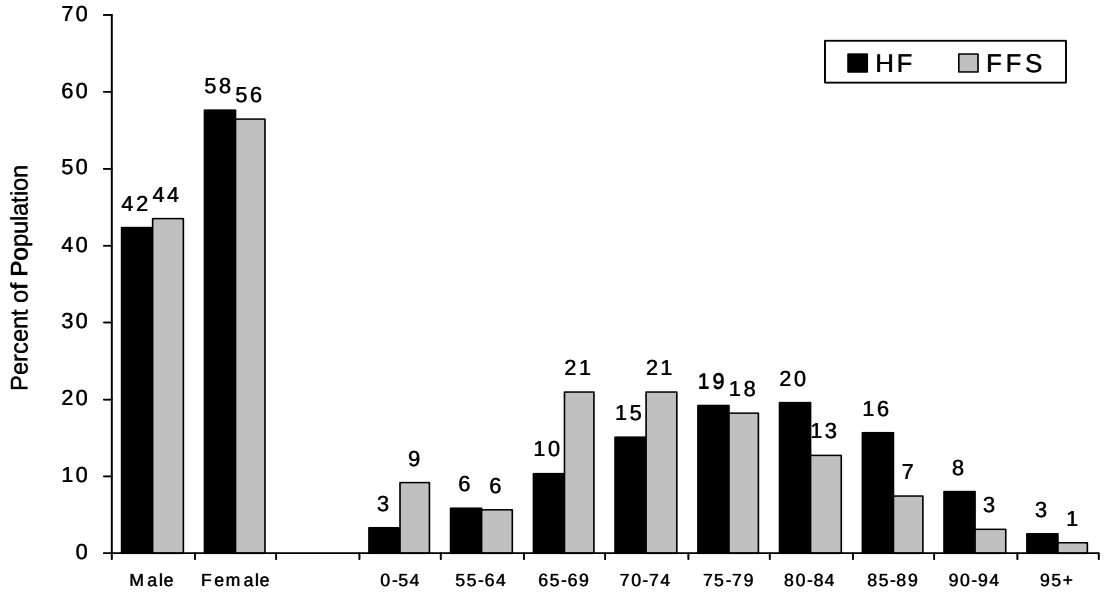
Appendix A contains a detailed description of the data sources, sample selection, and variable construction for each outcome measure used in this report. Appendix B provides supporting tables for each outcome, offering greater detail by demographic groups, state, and region than is presented in the body of the text.

[1] In the 6th scope of work, QIOs were only responsible for collecting information on the first two indicators.

II. CHARACTERISTICS OF THE FFS HEART FAILURE POPULATION

Over one-half million Medicare full-year FFS beneficiaries were hospitalized for heart failure in 2001. These beneficiaries—hereafter referred to as the heart failure population—represented just under 2 percent of the overall Medicare FFS population of 31.5 million in that year. Appendix Table B.3 presents a comparison of the heart failure population with the overall FFS population in 1992 and 2001.

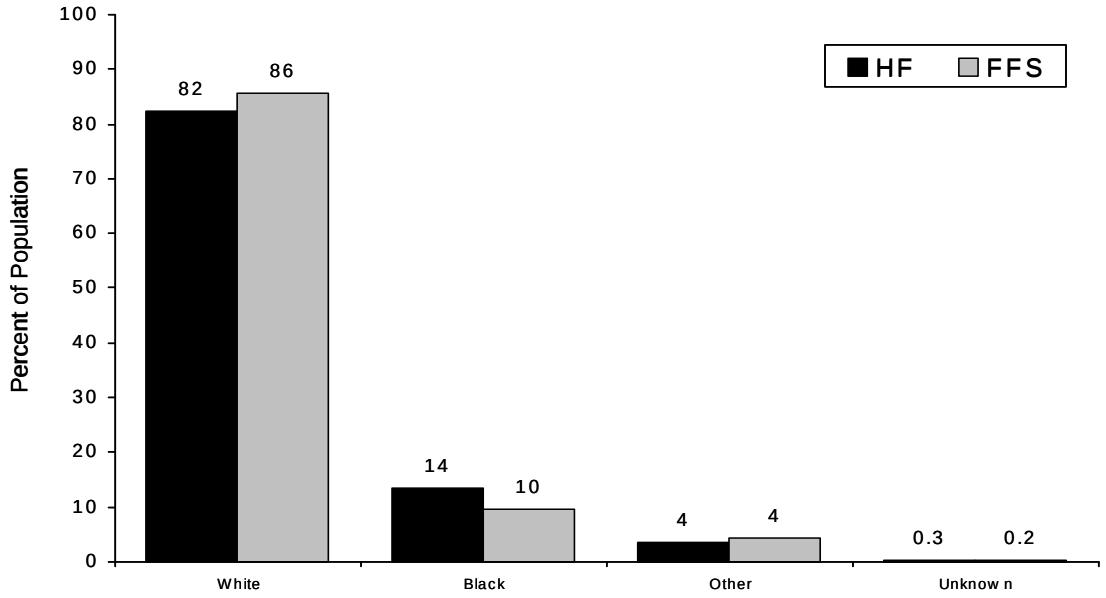
Figure II.1. Heart Failure Population and the Entire FFS Medicare Population, by Sex and Age Group, 2001



- Almost half (46 percent) of beneficiaries who were hospitalized for heart failure (identified by bars marked HF) in 2001 were age 80 or above compared with 23 percent of all Medicare FFS beneficiaries.

- The gender distribution of the heart failure population and the overall FFS population were similar; females represented 58 percent of heart failure beneficiaries and 56 percent of FFS beneficiaries (see Appendix table B.3).

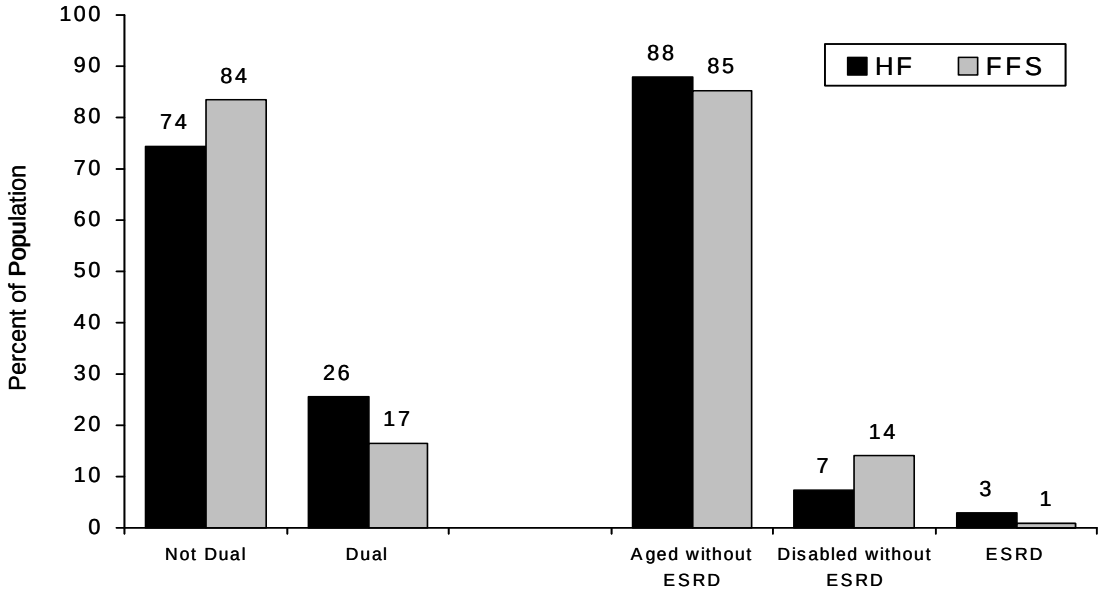
Figure II.2. Heart Failure Population and the Entire FFS Medicare Population, by Race, 2001



- Blacks comprised a larger proportion of the 2001 heart failure population (14 percent) than they did of the overall FFS population (10 percent).

- This pattern is consistent with a higher prevalence of heart failure among blacks compared with other racial groups (American Heart Association 2003).

Figure II.3. Heart Failure Population and the Entire FFS Medicare Population, by Medicaid Buy-In and Medicare Eligibility Status, 2001



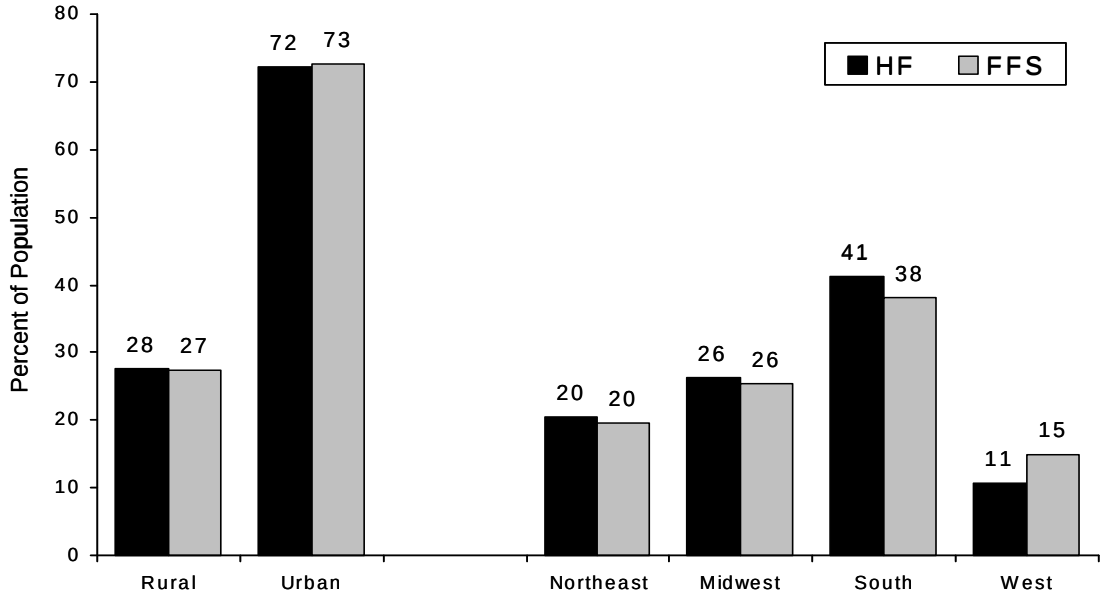
- Heart failure beneficiaries were disproportionately dually eligible for Medicaid. Over one-quarter of heart failure beneficiaries in 2001 were dually enrolled, compared with 17 percent of the entire FFS population (see Figure II.3).

- Between 1992 and 2001, the proportion of dually enrolled beneficiaries increased by about 7 percentage points for the heart failure population (from 19 to 26 percent) compared with a 5 percentage point increase among the entire FFS population (from 12 to 17 percent) (see Appendix Table B.3).

- Three percent of the heart failure population qualified for the Medicare End State Renal Disease (ESRD) benefit compared with 1 percent of the overall FFS population.

- Consistent with the older age distribution of heart failure beneficiaries, 7 percent of the heart failure population qualified as disabled without ESRD compared with 14 percent of the entire FFS population.

Figure II.4. Heart Failure Population and the Entire FFS Medicare Population, by Urban/Rural Status and Census Region, 2001

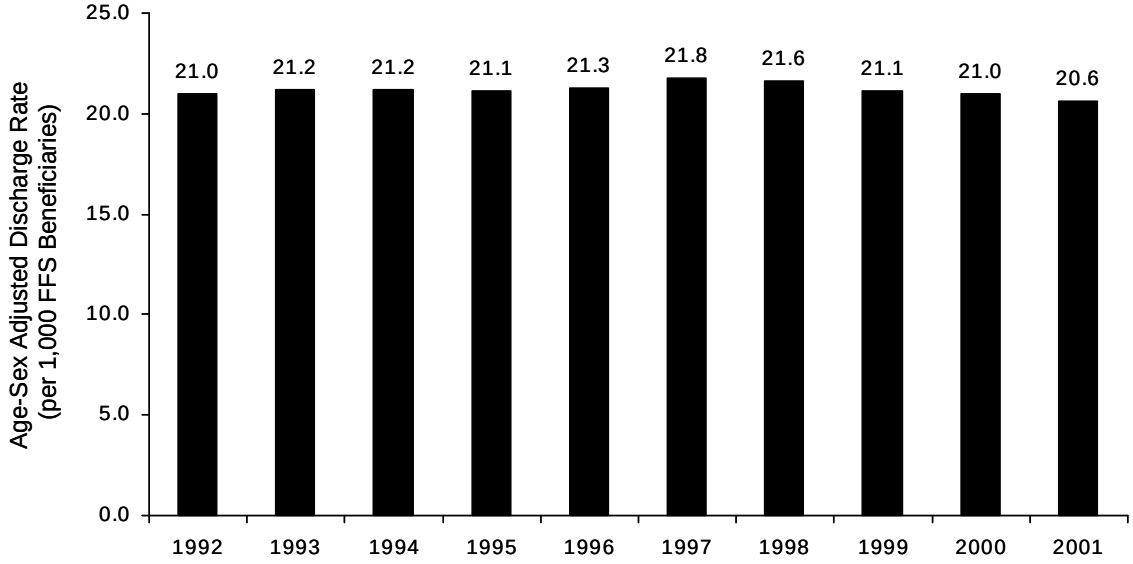


- Twenty-eight percent of heart failure patients and 27 percent of FFS beneficiaries lived in rural areas in 2001, a 1 percentage point increase for both populations from 1992.

- Slightly more heart failure patients than overall FFS beneficiaries lived in the South (41 percent versus 38 percent), and slightly fewer lived in the West (11 percent versus 15 percent).

III. HOSPITALIZATION FOR HEART FAILURE: RATES, EXPENDITURE, AND LENGTH OF STAY

Figure III.1. Trends in Medicare Heart Failure Hospital Discharge Rates, 1992–2001



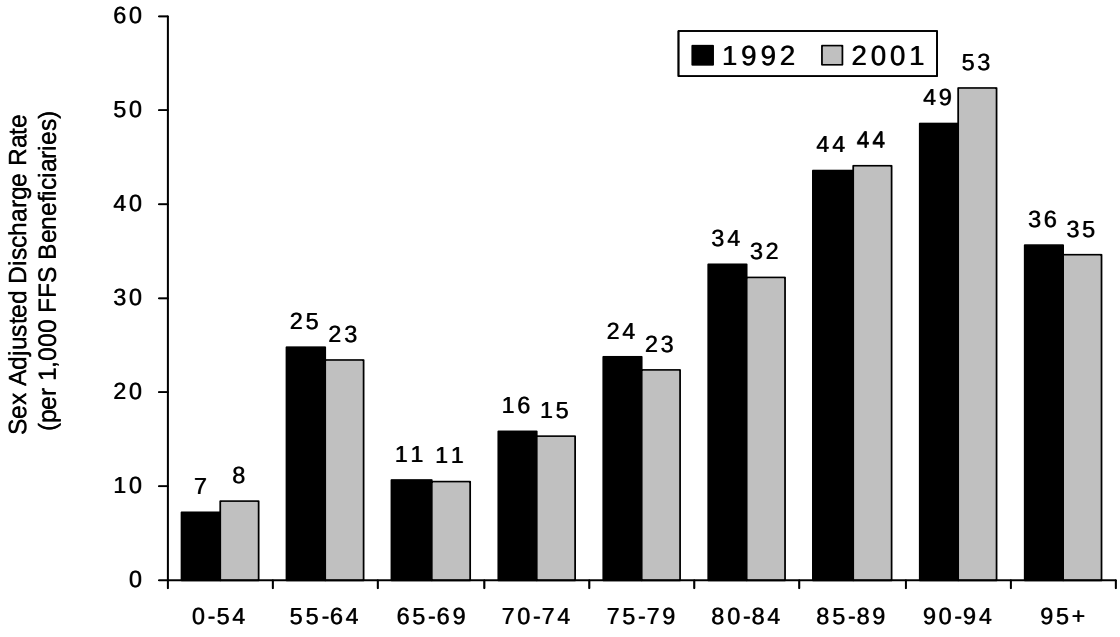
- In 2001, the rate of heart failure short-stay hospital discharges was 21 per 1,000 FFS beneficiaries, translating into over 687,000 discharges (see Appendix Table B.1).

- The rate of hospital discharges for heart failure remained virtually unchanged between 1992 and 2001. The age-sex–adjusted rate of hospitalization for heart failure declined by 2 percent between 1992 and 2001, or from 21.0 per 1,000 beneficiaries to 20.6 per 1,000 beneficiaries (see Figure III.1).

- The study period saw a slight rise then fall in the discharge rate. The rate peaked in 1997 at 21.8 per 1,000 beneficiaries and declined by 6 percent between 1997 and 2001 (see Appendix Table B.4).

- The measure of discharges per 1,000 beneficiaries is influenced by readmissions in the same calendar year. However, the rate of *beneficiaries* with at least one discharge for heart failure in the year also remained fairly steady over the period, decreasing by 3 percent from 16.1 per 1,000 beneficiaries in 1992 to 15.7 per 1,000 in 2001 (see Appendix Table B.5). The rate also showed a slight increase over the first part of the study period (to 16.6 per 1,000 in 1997) and then a decrease.

Figure III.2. Heart Failure Discharge Rate, by Age Group, 1992–2001



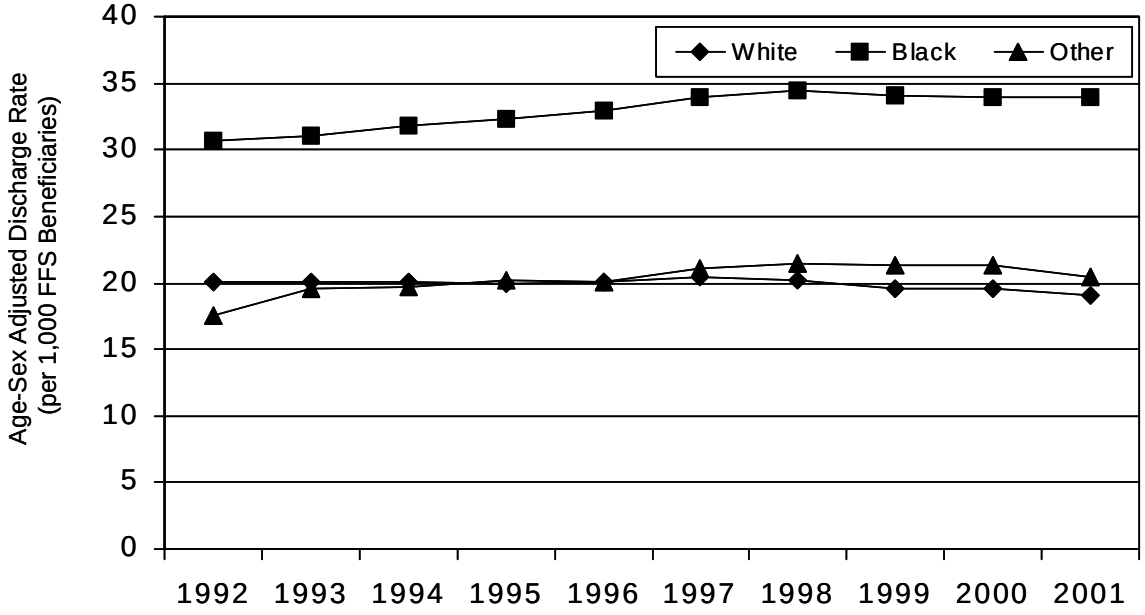
- Among beneficiaries age 65 and above, heart failure discharge rates increased steadily with age until age 94. Beneficiaries age 65 to 69 had a sex-adjusted discharge rate of only 11 per 1,000 in 2001 compared with 53 per 1,000 among those age 90 to 94 (see Figure III.2).

- Beneficiaries age 95 and above had somewhat lower discharge rates that were similar to those of beneficiaries age 80 to 84 (35 per 1,000). The lower rate is possibly attributable to increased mortality at the oldest ages.

- Disabled beneficiaries age 55 to 64 had heart failure discharges rates comparable to those of beneficiaries age 75 to 79 (23 per 1,000). Disabled beneficiaries are in generally poor health compared with beneficiaries in the younger age categories in the Medicare-age population.

- While most age groups experienced a slight decline in heart failure discharge rates, beneficiaries age 85 to 89 and 90 to 94 experienced increases in discharge rates of 1 and 8 percent, respectively. The fastest-growing rate in percentage terms occurred among disabled beneficiaries under age 55, whose discharge rate increased from 7.2 to 8.4 per 1,000, or by 17 percent (see Appendix Table B.4).

Figure III.3. Heart Failure Discharge Rate, by Race, 1992 and 2001

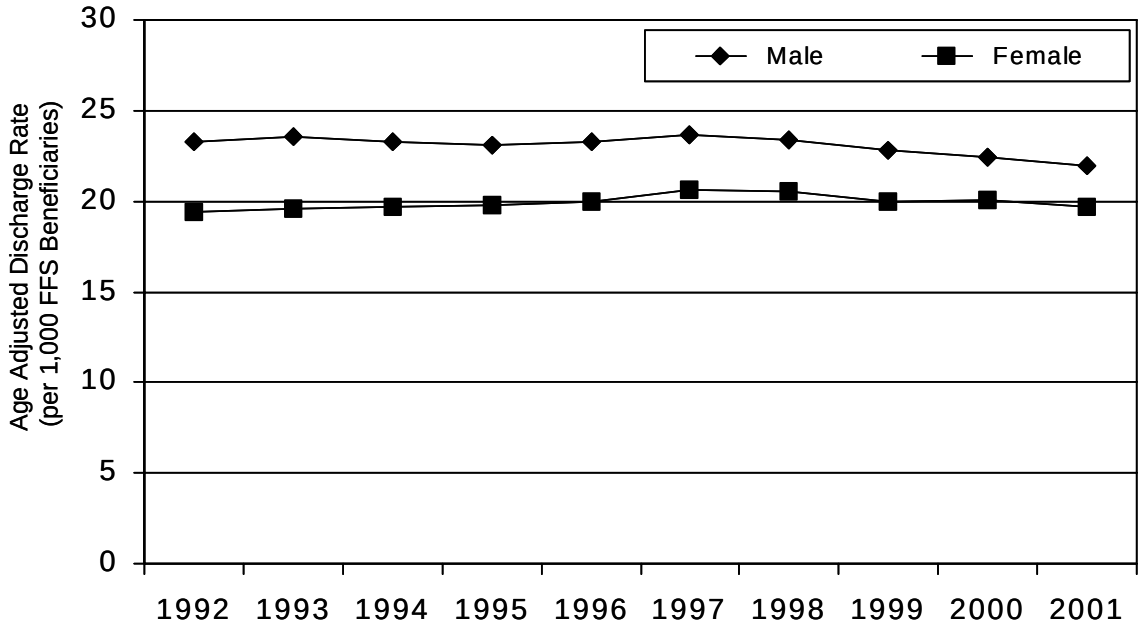


- There were notable racial differences in rates of heart failure discharges—in 2001, the age-sex– adjusted rate for whites was 56 percent of that for blacks. In 2001, heart failure discharges totaled 34 per 1,000 black beneficiaries compared with 19 per 1,000 white beneficiaries and 21 per 1,000 beneficiaries in other racial groups (see Figure III.3).

- Over the study period, the heart failure discharge rate among blacks increased by 11 percent while the rate among whites decreased by 5 percent (see Appendix Table B.4). The rate among other racial groups increased by 17 percent over the same period. The annual rate of increase in the discharge rate was more rapid for blacks in the first half of the period.

- Racial differences were also apparent in rates of *beneficiaries* with at least one heart failure discharge. Twenty-four per 1,000 black beneficiaries had at least one heart failure discharge in 2001 compared with 15 per 1,000 white beneficiaries (see Appendix Table B.5).

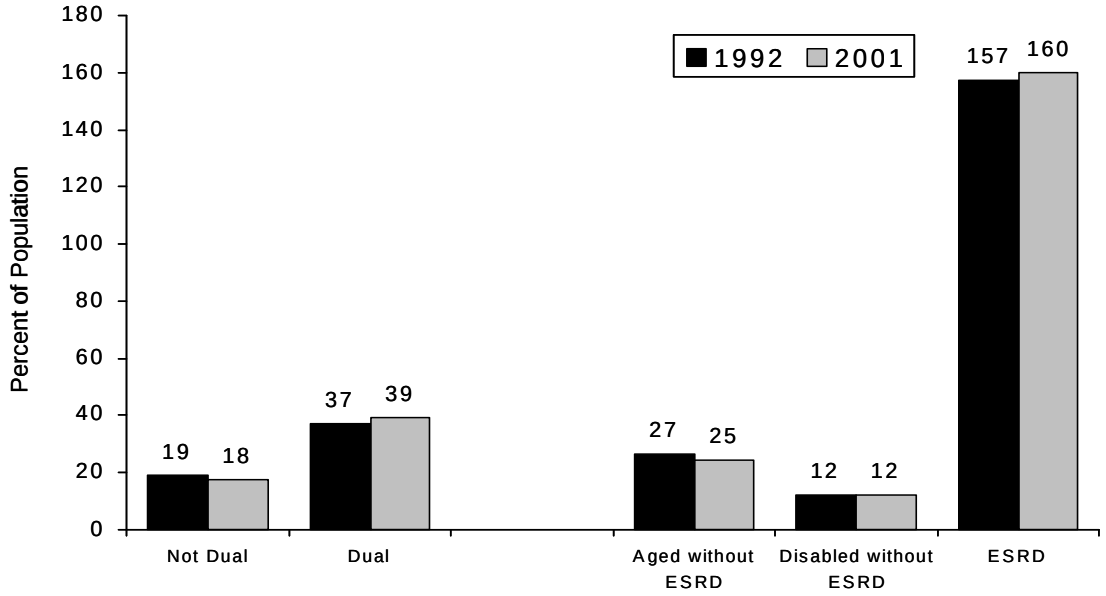
Figure III.4. Heart Failure Discharge Rate, by Sex, 1992 and 2001



- Although females accounted for a higher percentage of the heart failure population than males, the latter had a slightly higher age-adjusted discharge rate (22.0 per 1,000 beneficiaries) than females (19.7 per 1,000 beneficiaries).

- The discharge rate among males decreased by 5 percent between 1992 and 2001 while the rate for females increased by 2 percent over the same period. The decrease for males appears to have occurred mainly between 1997 and 2001.

Figure III.5. Heart Failure Discharge Rate, by Medicaid and Medicare Eligibility Status, 1992 and 2001



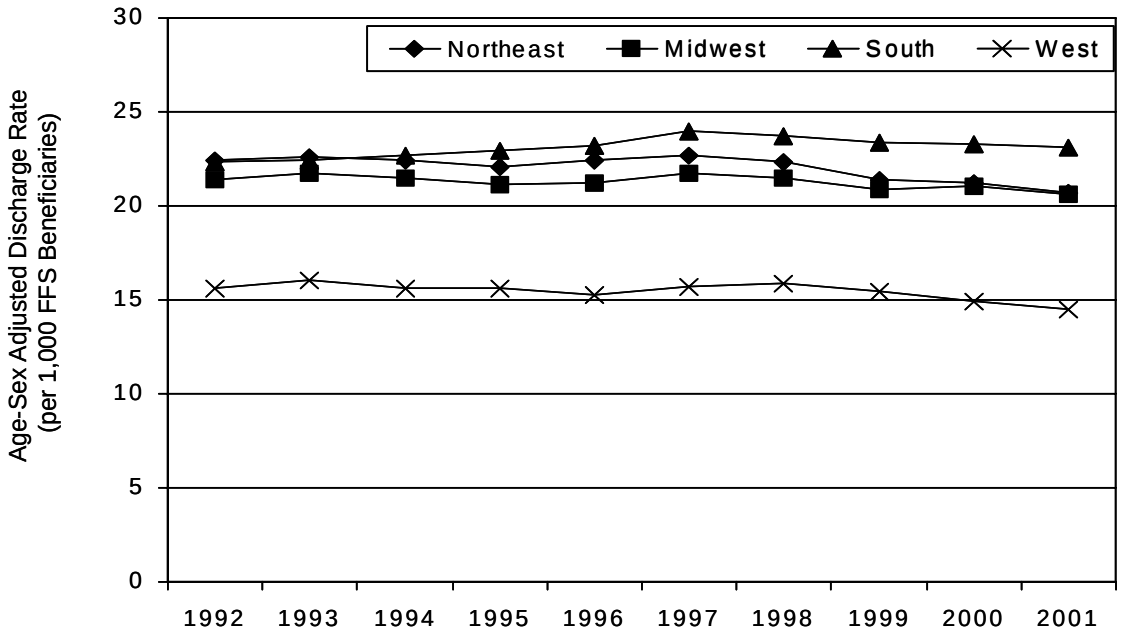
- Heart failure discharge rates among dual eligibles were much higher than among nondual eligibles. In 2001, the rate for dual eligibles was 40 per 1,000 beneficiaries compared with 18 per 1,000 beneficiaries among nondual eligibles (see Figure III.5).

- The heart failure discharge rate among dual eligibles increased by 7 percent from 1992 to 2001 as the rate among nondual eligibles fell by 8 percent (see Appendix Table B.4). While these rates are adjusted for age and sex, racial and health status differences in the dual- and nondual-eligible populations may help explain the patterns.

- The heart failure discharge rate among ESRD beneficiaries was many times higher than for other beneficiaries. ESRD beneficiaries had a discharge rate of 160 per 1,000 beneficiaries in 2001 compared with 25 per 1,000 beneficiaries among the elderly without ESRD and 12 per 1,000 among the disabled without ESRD. However, ESRD beneficiaries represented only 3 percent of the heart failure population in 2001.[2]

[2] The definition of heart failure in this study excludes patients with renal failure, but includes those with renal disease and hypertensive heart disease.

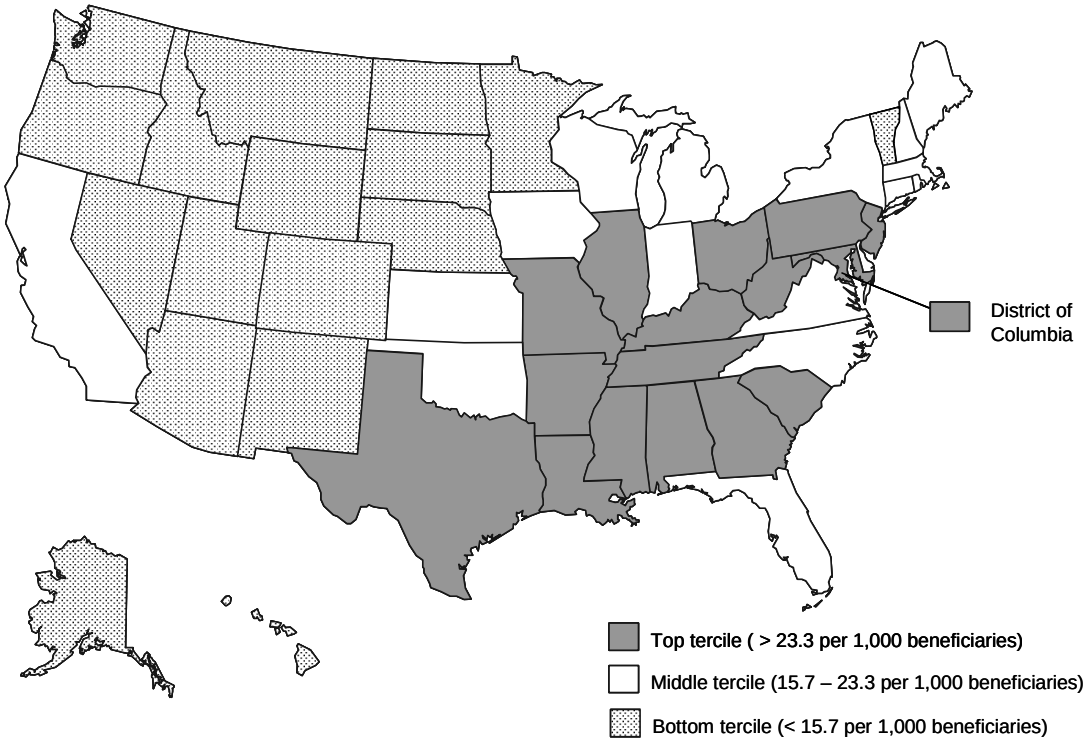
Figure III.6. Heart Failure Discharge Rate, by Census Region, 1992–2001



- Age-sex–adjusted heart failure discharge rates were uniformly lower in the western United States than in the rest of the country. In 2001, there were 14.5 heart failure discharges per 1,000 beneficiaries living in the West compared with 20.6 per 1,000 beneficiaries living in the Midwest, 20.7 per 1,000 in the Northeast, and 23.1 per 1,000 in the South (see Appendix Table B.4).

- Heart failure discharge rates decreased from 1992 to 2001 in all regions but the South, where the rate increased by 4 percent (see Appendix Table B.4).

Figure III.7. Heart Failure Discharge Rates, by State, 2001



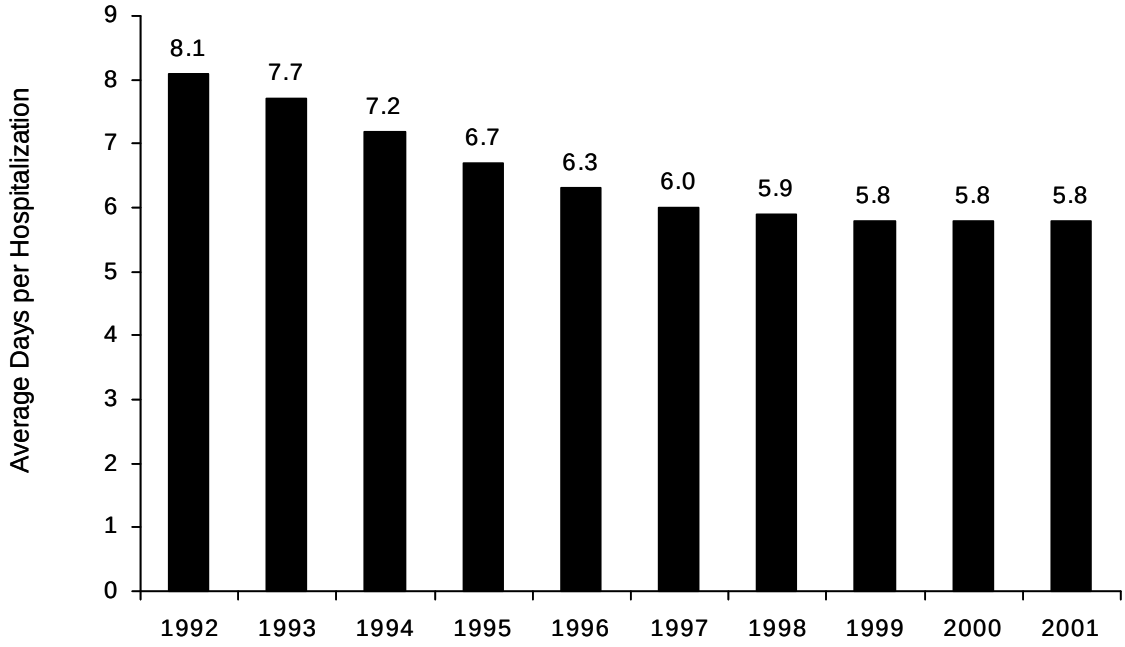
NOTE: Discharge rates are age-sex–adjusted.

- The nation showed strong geographic patterns in age-sex–adjusted heart failure discharge rates. Almost all western states were in the bottom tercile of discharge rates (with the exception of California, which was in the middle tercile) while most states in the South were in the top tercile of discharge rates.

- Both the level and change in heart failure discharge rates varied widely by state. State discharge rates ranged from 10.1 per 1,000 beneficiaries to 31.8 per 1,000 beneficiaries in 2001 (see Appendix Table B.4).

- Thirty-two states reported decreases in heart failure discharge rates between 1992 and 2001. Six states experienced decreases in discharge rates of 20 percent or more between 1992 and 2001 while three states saw increases of 11 to 12 percent (see Appendix Table B.4).

Figure III.8. Average Length of Stay for Heart Failure Hospitalizations, 1992–2001



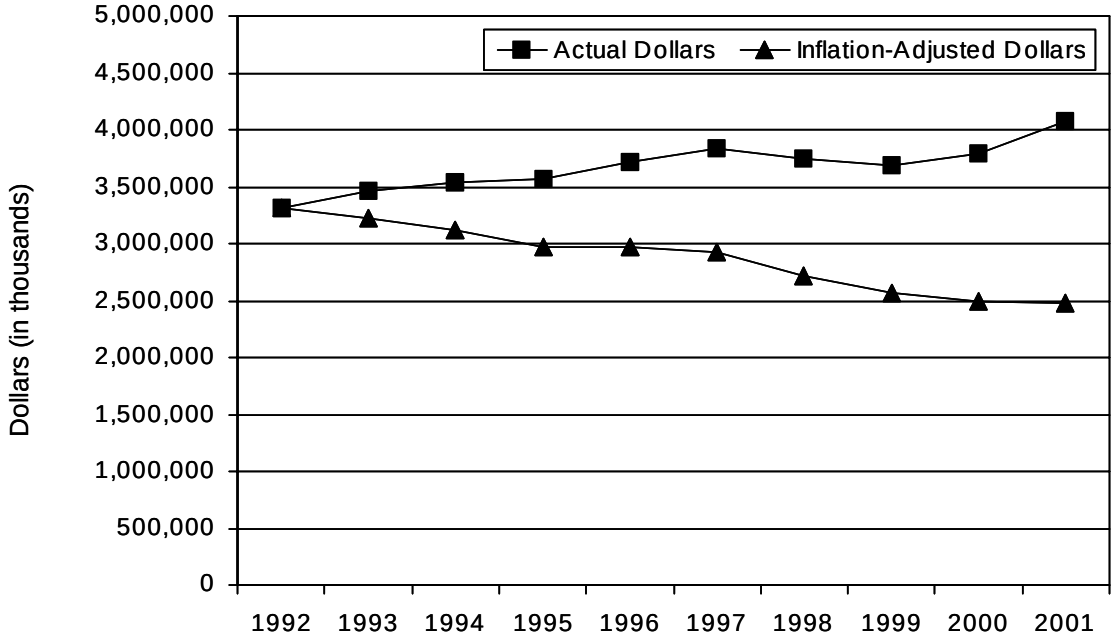
- Average length of stay for heart failure declined between 1992 and 2001. In 2001, the average hospital stay for heart failure was 5.8 days—2.3 days shorter than the average in 1992 (see Figure III.8). The sharpest declines occurred from 1992 to 1995, when stays fell by nearly half a day per year.

- The reduction in length of stay for heart failure was comparable to the decline in length of stay for overall Medicare hospital stays. From 1993 and 1998, the average length of a Medicare acute-care stay fell by 27 percent from eight to six days (Medicare Statistical Supplement 1995; 2000). During those years, the average heart failure length of stay fell by 23 percent (calculated from Appendix Table B.6).

- Length of stay varied noticeably by geographic region of the hospital. The Northeast had an average age-sex–adjusted length of stay per heart failure hospitalization of 6.6 days compared with 5.7 days in the South, 5.5 days in the Midwest, and 5.3 days in the West (see Appendix Table B.6).

- Average length of stay also varied by state. In 2001, two states had average length of stay of 4.5 days or less while two states had average length of stay of 7.5 days or above (see Appendix Table B.6). The median of state-level length of stay declined from 7.7 to 5.5 days from 1992 to 2001.

Figure III.9. Total Medicare Payments for Heart Failure Hospitalizations, 1992–2001



NOTE: Dollars are adjusted by using the Bureau of Economic Analysis's personal consumption expenditure index for medical services and are expressed in 1992 dollars

- Total annual Medicare payments for heart failure hospitalizations increased by 23 percent over the period, from $3.3 billion in 1992 to $4.1 billion in 2001 (see Figure III.9). In constant 1992 dollars, payments fell from $3.3 to $2.5 billion.

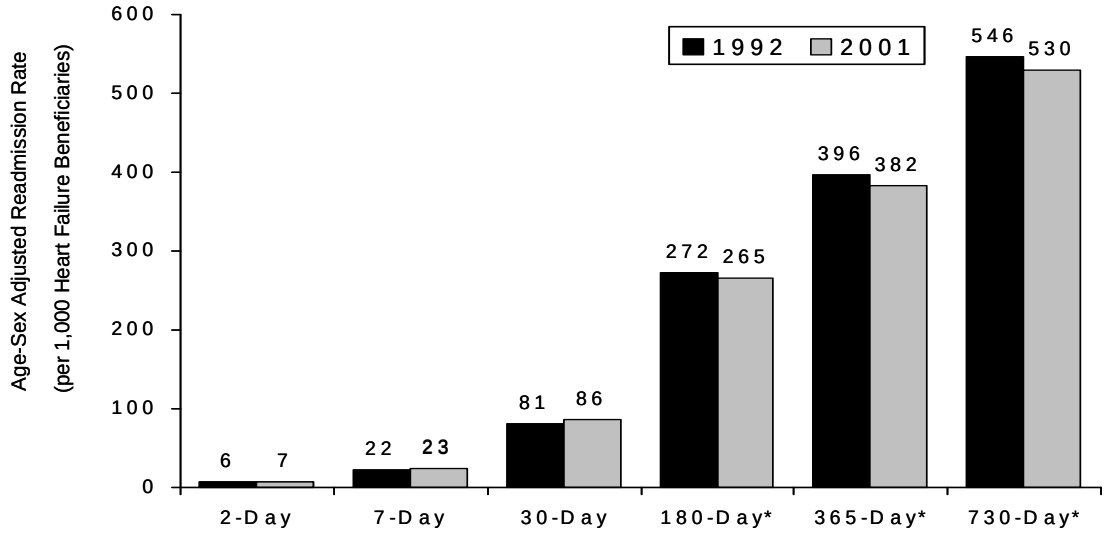
- Average Medicare payment per heart failure discharge increased by 20 percent, from $4,948 to $5,928, over the same period (see Appendix Table B.8). The greatest change from year to year in average payment occurred between 2000 and 2001, when average payments increased almost $500, or 6 percent (see Table B.8).

- The increase in payment per heart failure discharge was less than the increase in payment for Medicare hospital discharges in general. The average payment per discharge for heart failure increased by 8 percent between 1993 and 1998 (see Appendix Table B.8) while the mean payment for all acute-care Medicare hospital stays increased by 21 percent (Health Care Financing Review 1995; 2000, Table 26).

- Total beneficiary payments—in the form of coinsurance and deductibles—for heart failure hospitalizations increased by 9 percent over the period, from about $329 million in 1992 to $358 million in 2001 (see Appendix Table B.9). The payments averaged $493 dollars per discharge in 1992 and $521 per discharge in 2001 (calculated from Appendix Tables B.1 and B.9).

IV. READMISSION AFTER HEART FAILURE HOSPITALIZATION

Figure IV.1. Heart Failure Readmission Rates, by Days from Heart Failure Discharge, 1992 and 2001



* Data were not available for 2001; 180-day and 365-day rates are for discharges occurring in 2000, 730-day rates are from 1999 discharges.

- In 2001, 86 per 1,000 beneficiaries discharged for heart failure were readmitted for heart failure within one month (see Figure IV.1).[3] Within one year, 382 per 1,000 had been readmitted for heart failure.

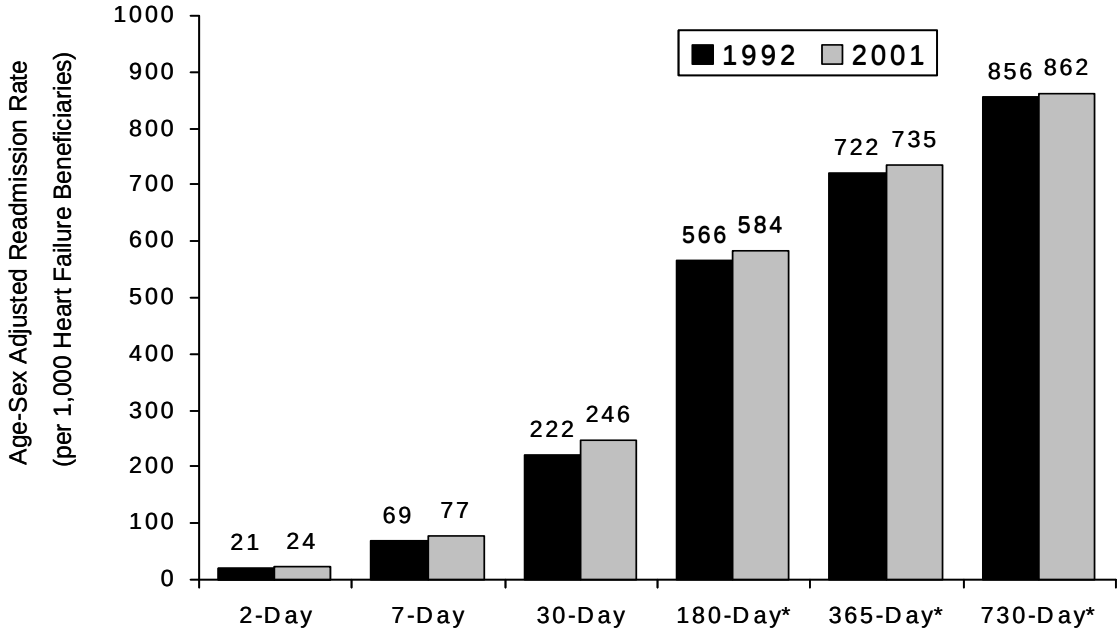
- Rates of short-term (within 2, 7, or 30 days) heart failure readmissions increased slightly while long-term (180, 365, and 730 days) rates decreased from 1992 to 2001. For example, 30-day heart failure readmission rates increased by 6 percent and one-year readmission rates for heart failure fell 3 by percent, from 396 per 1,000 heart failure beneficiaries to 382 per 1,000 heart failure beneficiaries, from 1992 to 2001 (see Appendix Table B.13).

- The mean number of heart failure discharges per heart failure beneficiary each year remained virtually unchanged over the period, at 1.3 per 1,000 heart failure beneficiaries (see Appendix Table B.10).

- Readmission rates were higher among men than women (91 per 1,000 and 82 per 1,000, respectively) and among dual eligibles compared with nondual eligibles (98 per 1,000 and 81 per 1,000, respectively) (see Appendix Table B.13).

[3] Rates are based on the first heart failure admission in a year. See appendix tables B.14 and B.15 for rates based on each heart failure discharge in a year.

Figure IV.2. All-Cause Readmission Rates, by Days from Heart Failure Discharge, 1992 and 2001



* Data were not available for 2001; 180-day and 365-day rates are for 2000, 730-day rates are from 1999.

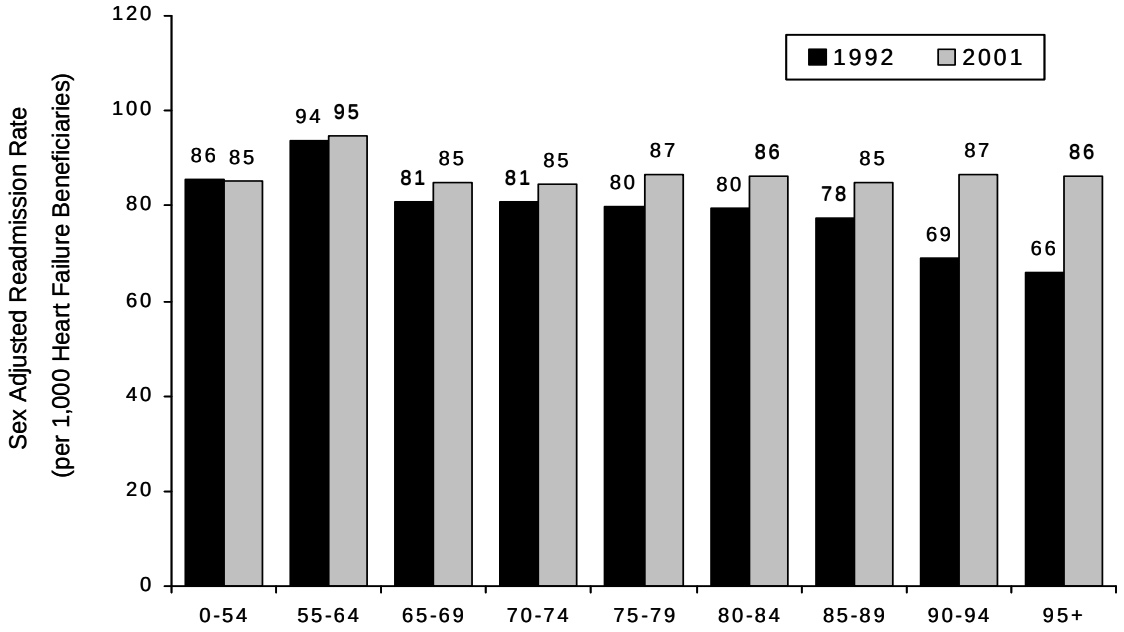
- Rates of readmissions for all causes indicate that heart failure beneficiaries are often admitted for other reasons. For example, the 30-day all-cause readmission rate was 246 per 1,000 compared with the heart failure–specific rate of 86 per 1,000 (see Appendix Table B.12). One-year all-cause readmission rates were 735 per 1,000 compared with 382 per 1,000 for heart failure readmissions.

- Given that this study identifies heart failure readmissions by a *principal* diagnosis of heart failure, all-cause rates may capture heart failure–related readmissions that have a different principal diagnosis. For example, claims may be coded with pneumonia as the principal diagnosis and heart failure as the secondary diagnosis.

- All-cause readmission rates exhibited a slightly greater increase over the period than heart failure–specific rates. From 1992 to 2001, the 30-day all-cause rate increased by 11 percent (compared with 6 percent for heart failure readmissions) and the one-year rate by 2 percent (compared with a 3 percent decline for heart failure readmissions).

- The mean number of hospital discharges (for any cause) in the year among heart failure beneficiaries increased by 11 percent, from 2.3 in 1992 to 2.5 in 2001 (see Appendix Table B.11).

Figure IV.3. 30-Day Heart Failure Readmission Rates, by Age Group, 1992 and 2001

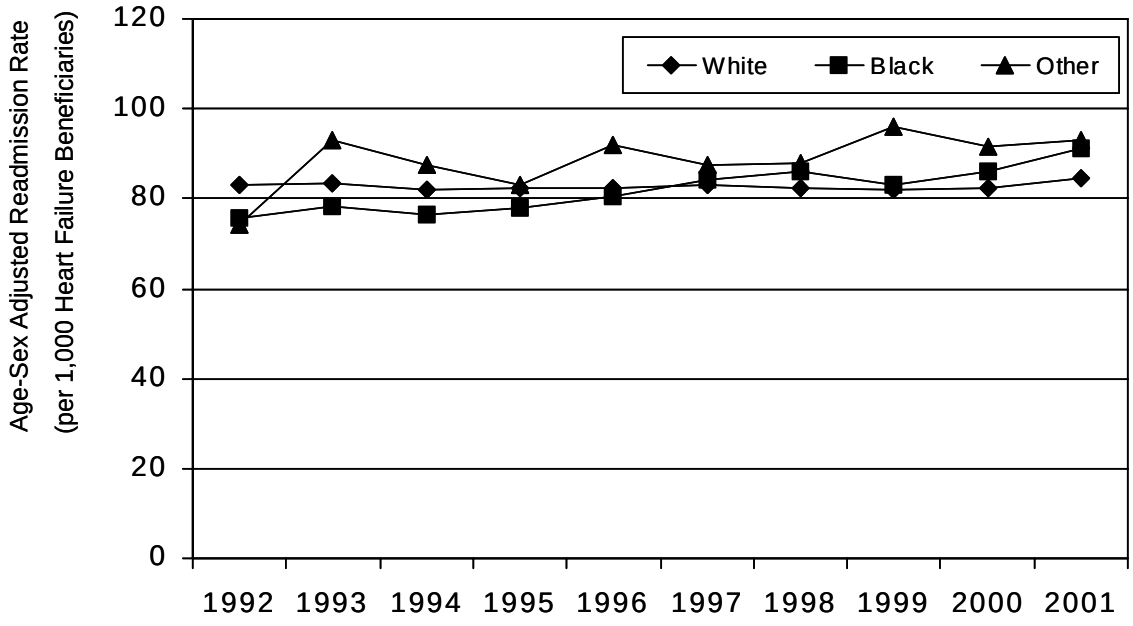


- Heart failure readmission rates were nearly constant by age group in 2001 (see Figure IV.2). This pattern may be attributable to the competing force of mortality among the older age groups.

- Beneficiaries age 55 to 64 had the highest 30-day readmission rate of 95 per 1,000.

- The oldest age groups showed the largest increases in readmission rates from 1992 to 2001. For example, the readmission rate among beneficiaries age 95 and over increased from 66 per 1,000 in 1992 to 86 per 1,000 in 2001.

Figure IV.4. 30-Day Heart Failure Readmission Rates, by Race, 1992–2001



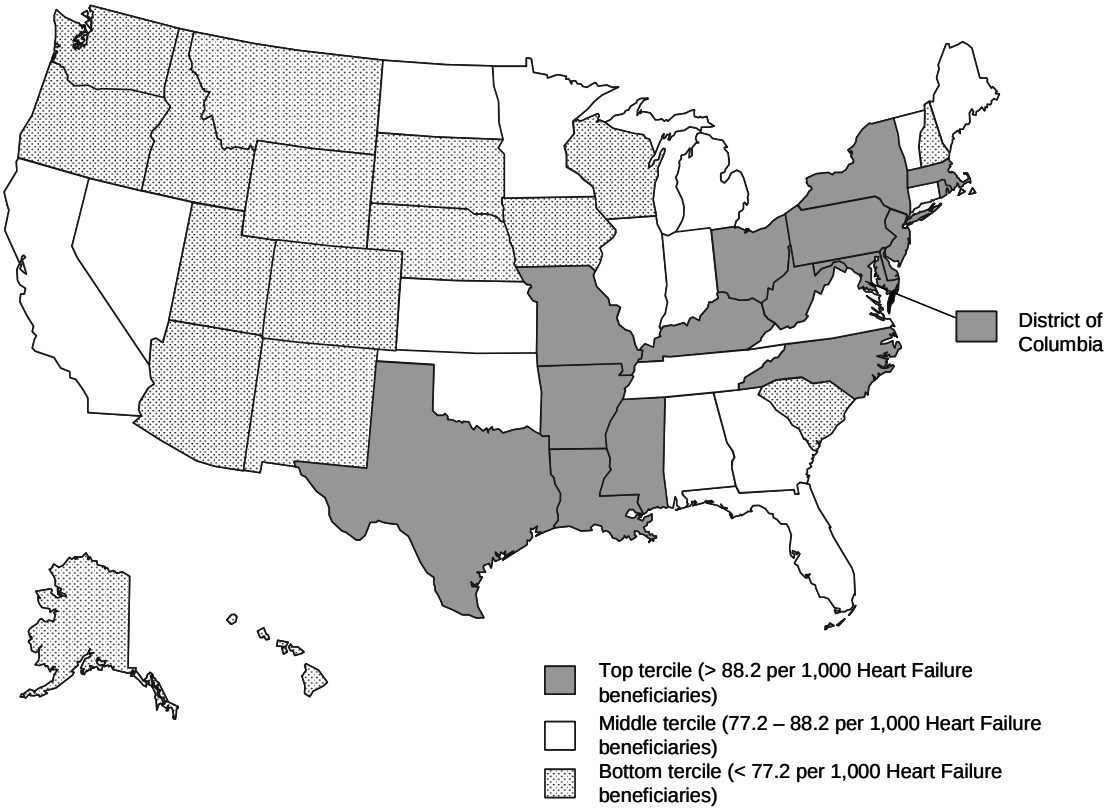
- Heart failure readmission rates varied by racial group. In 2001, the 30-day heart failure readmission rate for whites was 85 per 1,000 while it was 91 per 1,000 among blacks and 93 per 1,000 among other racial groups (see Appendix Table B.13).

- However, in 1992, blacks and other racial groups had lower heart failure readmission rates (76 per 1,000 and 74 per 1,000, respectively) than whites (83 per 1,000). Over the study period, however, the readmission rate among blacks and other racial groups increased by, respectively, 20 and 25 percent compared with a 2 percent increase among whites (see Appendix Table B.13).

- Over the study period, one-year heart failure readmission rates were 18 percent higher among blacks than whites. For example, in 2000, one-year heart failure readmission rates were 433 per 1,000 among blacks, 424 per 1,000 among other racial groups, and 368 per 1,000 among whites.

- Blacks had slightly lower short-term all-cause readmission rates than whites but experienced a larger increase over the period. The 30-day all-cause readmission rate among whites increased by 9 percent (from 227 to 247 per 1,000) while the rate for blacks increased by 22 percent (from 200 to 244 per 1,000) (see Appendix Table B.12).

Figure IV.5. 30-Day Heart Failure Readmission Rates, by State, 2001



NOTE: Discharge rates are age-sex–adjusted.

- There was a noticeable regional pattern in heart failure readmission rates, with lower rates in the West and higher rates in the South and Northeast, although the pattern is not as strong as it was for heart failure discharge rates (see Figure IV.4). Similar to the pattern for discharge rates, rates in the Midwest were typically higher among the East North Central states but lower among the West North Central states.[4]

- The western states as a group had the lowest heart failure readmission rates. In 2001, rates in the West were 77 per 1,000 compared with 89 in the South and 90 in the Northeast (see Appendix Table B.13). From 1992 to 2001, the southern states experienced the largest increase (10 percent) in 30-day heart failure readmission rates compared with no change among the western states.

[4] Regardless of where they occur, readmissions are assigned to the state of the provider of the index admission.

- One-year heart failure readmission rates showed a similar pattern across states (see Appendix Table B.13).

Table IV.1. State Variation in 30-Day Heart Failure Readmission Rates

	Age-Sex–Adjusted 30-Day Heart Failure Readmission Rates per 1,000 Beneficiaries Discharged with Heart Failure*		
	1992	1996	2001
Minimum	46.9	52.0	54.3
25th percentile	73.4	72.1	73.7
Median	77.0	80.0	83.8
75th percentile	81.7	87.0	90.0
Maximum	96.5	96.4	99.1

* One state was excluded from this analysis due to small sample size.

- At the state level, short-term heart failure readmission rates increased from 1992 to 2001. The median state readmission rate increased by 9 percent, from 77 per 1,000 to 84 per 1,000 (see Table IV.1).

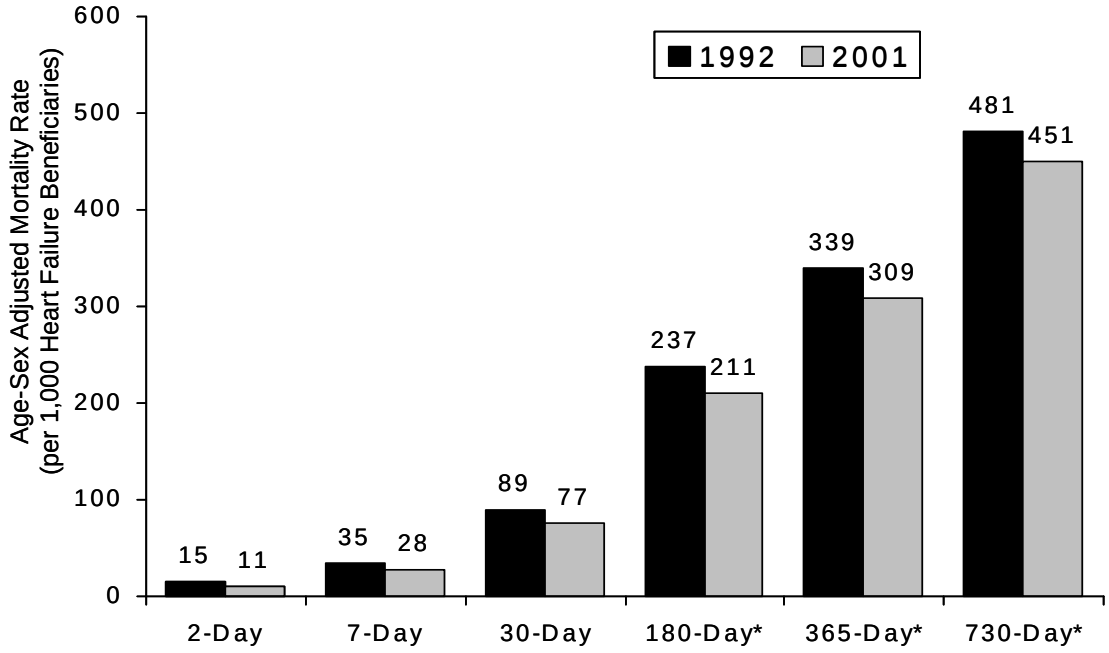
- The states showed wide variation in 30-day heart failure readmission rates . For example, rates in 2001 ranged from 54 per 1,000 to 99 per 1,000.

- Cross-state variability in heart failure readmission increased slightly over the period. The proportional discrepancy between the 25th and 75th percentiles of the distribution of readmission rates was 5 percent in 1992 and 9 percent in 2001.[5]

[5] The proportional difference is computed as: log(25th percentile/75th percentile).

V. MORTALITY AFTER HOSPITALIZATION FOR HEART FAILURE

Figure V.1. Mortality Rates Following Heart Failure Hospitalization, by Days from Admission, 1992–2001



* Data were not available for 2001; 180-day and 365-day rates are for 2000, 730-day rates are from 1999.

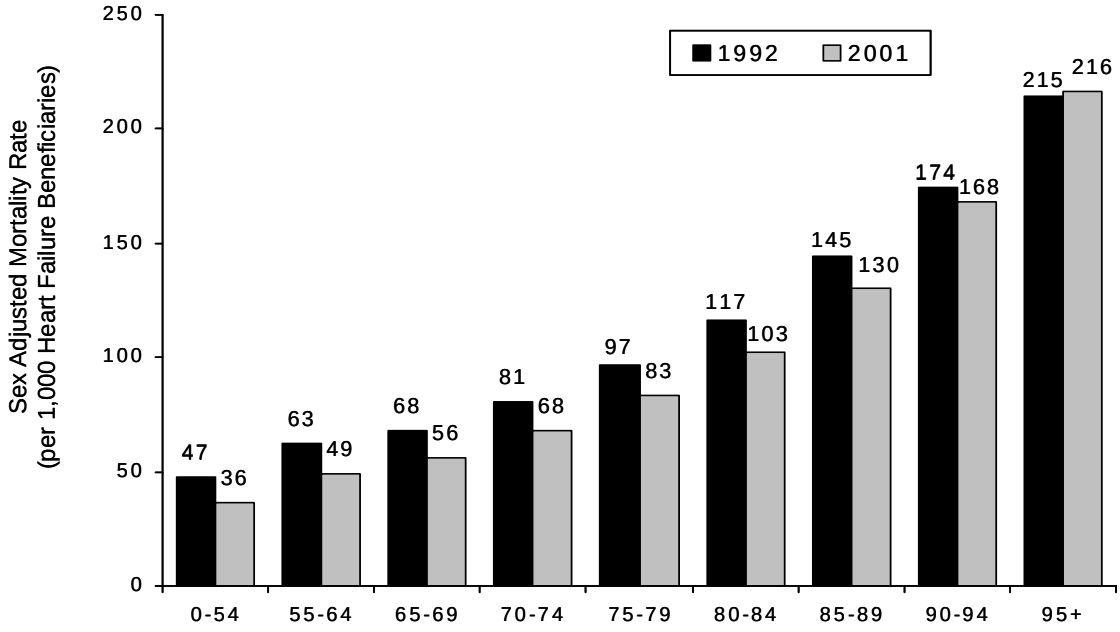
- In 2001, 77 per 1,000 heart failure beneficiaries died (from any cause) within one month following admission while 309 per 1,000 in 2000 (the latest year for which data are available) died within one year following admission, and 451 per 1,000 in 1999 died within two years after admission.

- Mortality rates (at all window lengths) decreased over the period. For example, 30-day mortality rates decreased by 14 percent from 1992 to 2001, and one-year mortality rates fell by 9 percent from 1992 to 2000 (see Appendix Table B.16). The rates appear to have decreased slightly more in the first half of the study period.

- As with readmission rates, the 30-day mortality rate for men (88 per 1,000 in 2001) was higher than for females (68 per 1,000) (see Appendix table B.16).

- In 2001, dual eligibles had a slightly lower 30-day mortality rate than nondual eligibles (74 per 1,000 and 78 per 1,000, respectively), but higher mortality after one year (326 per 1,000 among dual eligibles and 304 per 1,000 among nondual eligibles).

Figure V.2 30-Day Mortality Rate Following Heart Failure Hospitalization, by Age Group, 1992 and 2001

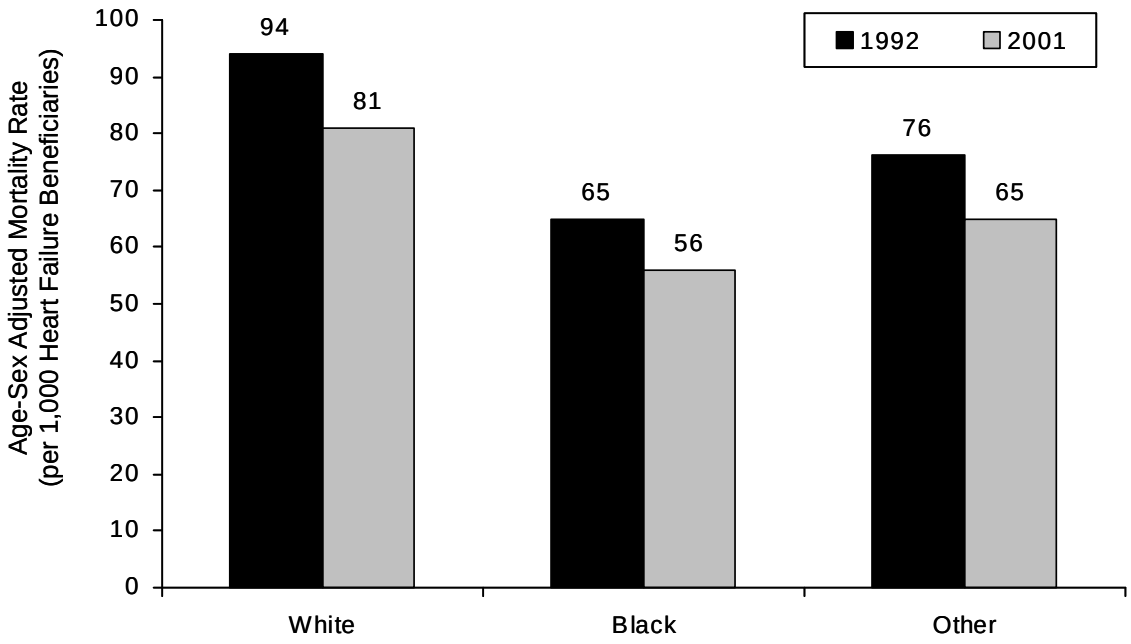


- Mortality rose steadily by age group. After 30 days, 56 per 1,000 of those age 65 to 69 had died compared with 216 per 1,000 among those age 95 and above (see Figure V.2).

- Younger beneficiaries experienced the greatest gains in mortality reductions. For example, 30-day mortality among those age 65 to 69 decreased by 18 percent over the period (see Appendix Table B.16). The only age group to show an increase (of 1 percent) in mortality were beneficiaries age 95 and above.

- One-year mortality showed a similar pattern by age group, with rates rising steadily with age, but the greatest gains in mortality reduction over the period occurred among the younger age groups (see Appendix Table B.16). Within one year, 244 per 1,000 heart failure beneficiaries age 55 to 64 died compared with 529 per 1,000 beneficiaries age 90 to 94.

Figure V.3. 30-Day Mortality Rate Following Heart Failure Hospitalization, by Race, 1992 and 2000

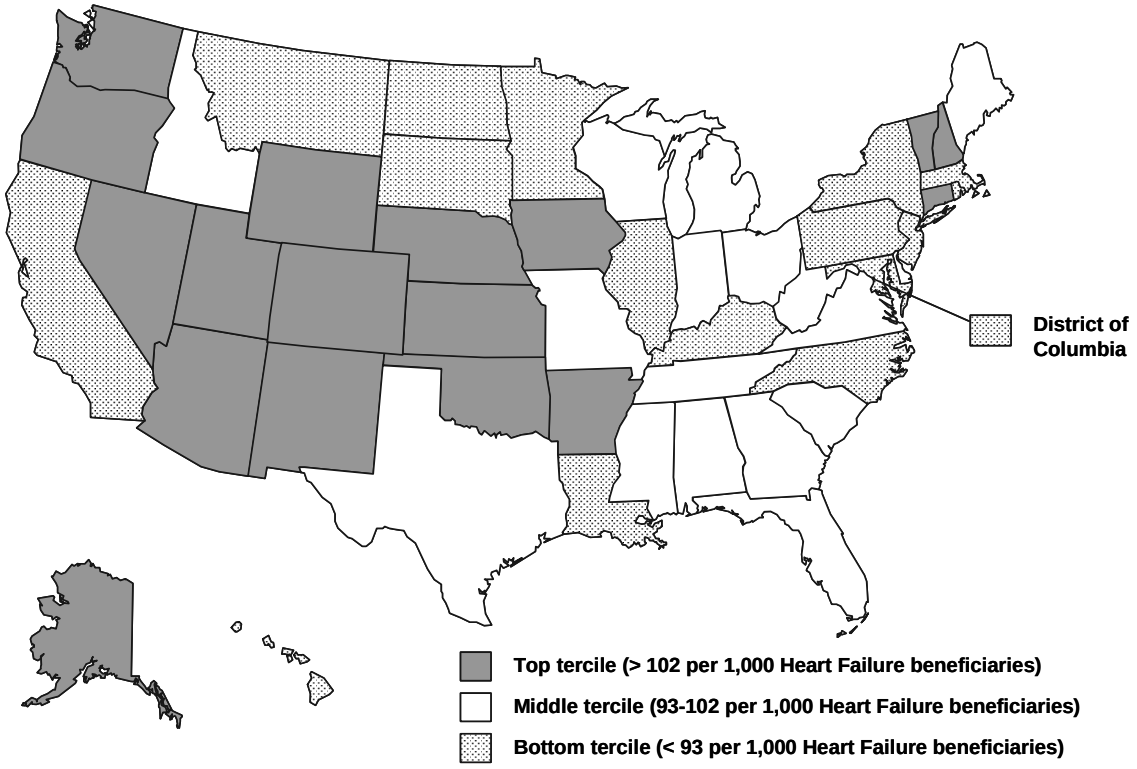


- Mortality rates by racial group revealed an opposite pattern from readmission rates by racial group.

- Mortality rates following heart failure admission were lower among blacks and other racial groups than whites. In 2001, 30-day mortality rates were 56 per 1,000 among blacks and 65 per 1,000 among other racial groups compared with 81 per 1,000 among whites. All groups experienced similar declines in mortality rates (see Figure V.3).

- One-year mortality rates exhibited a similar pattern by race. In 2000, 315 per 1,000 white heart failure patients died within one year of heart failure hospitalization compared with 280 per 1,000 blacks (see Appendix Table B.16). One-year mortality rates declined by 9 percent for whites and by 8 percent for blacks from 1992 to 2000.

Figure V.4. 30-Day Mortality Rates Following Heart Failure Hospitalization, by State, 2001



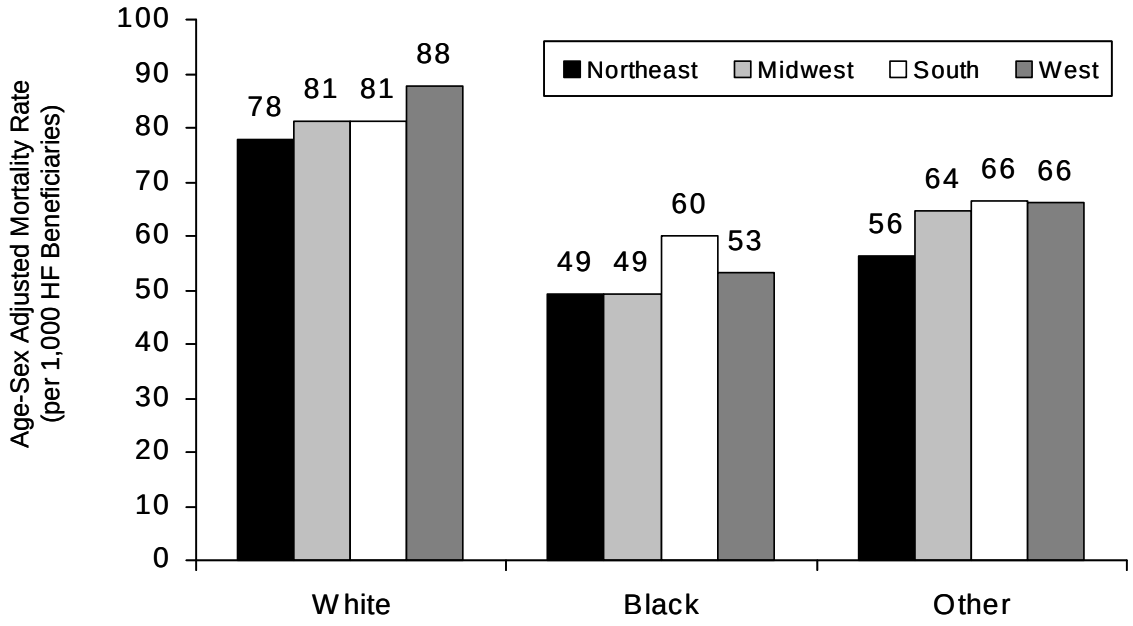
NOTE: Discharge rates are age-sex–adjusted.

- The pattern of mortality rates by state also differed from the pattern of readmission and discharge rates. As seen in Figure V.4, many of the western and West Central states that were in the lowest tercile (age-sex–adjusted) for readmission rates were in the highest tercile for 30-day mortality rates.

- By census region, mortality was highest in the West (82 per 1,000 after 30 days in 2001) and lowest in the Northeast (74 per 1,000 in 2001) (see Appendix Table B.16.). The South experienced the largest decline in short-term mortality: discharge rates declined 16 percent, from 91 per 1,000 to 76 per 1,000 from 1992 to 2001.

- Similar patterns were apparent by state in one-year mortality rates (results not shown). However, a few states moved between the top and bottom tercile of short- and long-term rates. While most of these states were small (so their large relative differences in these two rates may have been influenced by small population sizes), one populous state—New Jersey—moved from the lowest tercile of 30-day mortality to the highest tercile of one-year mortality.

Figure V.5. 30-Day Mortality Rates Following Heart Failure Hospitalization, by Race and Region, 2001



- Blacks had the lowest 30-day mortality rates in 2001 in all regions of the country (see Figure V.5). However, regional short-term mortality patterns differed slightly by race. While whites exhibited a pattern similar to the overall rates, with the highest mortality in the West, blacks had the highest mortality in the South, followed by the West.

- For one-year mortality, both blacks and whites exhibited the same regional variation in mortality, with the highest rates in the West (results not shown).

Table V.1. State Variation in 30-Day Mortality Rates Following Heart Failure Hospitalization

	Age-Sex–Adjusted 30-Day Mortality Rates per 1,000 Beneficiaries Admitted for Heart Failure		
	1992	1996	2001
Minimum	70.7	77.5	60.8
25th percentile	102.7	95.6	90.8
Median	109.9	101.2	97.7
75th percentile	114.0	105.6	108.6
Maximum	135.4	123.8	134.5

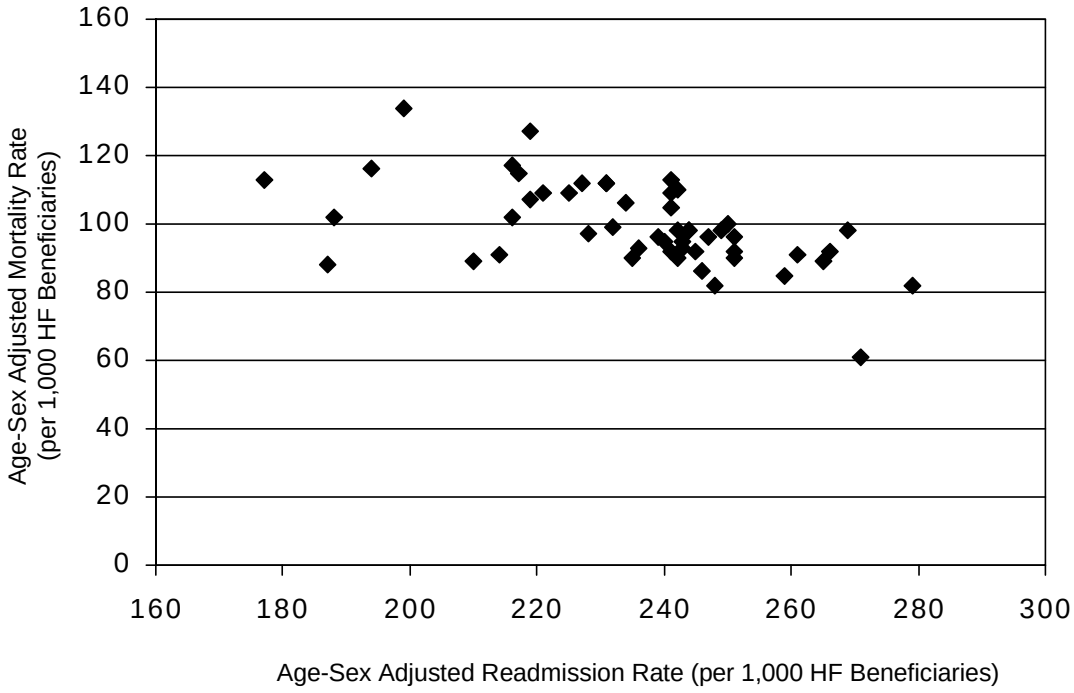
- There was pronounced state-to-state variation in mortality rates following heart failure hospitalization. The 30-day mortality in 2001 ranged from 61 per 1,000 to 135 per 1,000 (see Appendix Table B.16). While some of the extreme values may have come from states with small heart failure populations, there was still a sizable discrepancy between the 25th percentile (91 per 1,000 in 2001) and the 75th percentile (109 per 1,000 in 2001).

- Evidence suggests a decline in 30-day mortality following heart failure admission as measured by state rates. Median state mortality fell by 12 percent, from 110 per 1,000 in 1992 to 98 per 1,000 in 2001. The minimum rate and the 25th and 75th percentiles declined as well (see Table V.1).

- Cross-state variation in mortality rates, as measured by the proportional difference in the 25th to the 75th percentile, increased slightly, from 5 percent in 1992 to 8 percent in 2001.[6]

[6] The proportional difference is computed as: log(25th percentile/75th percentile).

Figure V.6. 30-Day All-Cause Readmission and Mortality Following Heart Failure Hospitalization, by State, 2001



- To investigate further a potential relationship between readmission and mortality rates by state, Figure V.6 presents the 30-day all-cause readmission and mortality rate combination for each state in 2001. The figure suggests a negative correlation between readmission rates (on the horizontal axis) and mortality rates (on the vertical axis). The two variables have a negative correlation of –0.56.

- The pattern between readmission and mortality using heart failure–specific readmission is not as strong (results not shown). The correlation was negative, but slightly smaller, at –0.45.

- However, there was no apparent relationship between one-year readmission rates (heart failure or all cause) and mortality rates by state (results not shown).

VI. DISCUSSION

Discharge rates for heart failure—the most common reason for hospitalization among Medicare beneficiaries and a condition commonly considered a preventable hospitalization condition—remained almost unchanged at 21 per 1,000 FFS beneficiaries from 1992 to 2001. Despite small declines in long-term heart failure readmission rates and mortality rates, the study period showed an increase in all-cause readmission rates and in short-term heart failure readmission rates. As fewer beneficiaries die, an increasingly frail population of beneficiaries with heart failure could need treatment.

The finding of higher readmission but lower mortality rates among blacks with heart failure in the present analysis is consistent with a recent finding that used National Heart Failure Project data and controlled for beneficiary comorbidities and provider characteristics (Rathore et al. 2003). That study also found that blacks received inpatient heart failure treatment comparable to that received by whites and had higher rates of ACEI use. The authors suggest the possibility of a survivor effect among older black beneficiaries.

The variation across racial and geographic subgroups in this report is hard to interpret without controlling for differences in comorbidities and severity of illness, the availability of outpatient management of heart failure, and provider characteristics. The finding of a negative relationship between short-term readmission and mortality rates across states is an area for further research. Future MQMS reports on heart failure will include an analysis of variations in the duration from discharge to either readmission or death; this should help to better identify state variation in adverse outcomes.

Since heart failure is considered a preventable hospitalization condition, one important addition to understanding differences in heart failure outcomes may be the addition of a claims-based measure of outpatient management—such as the receipt of a physician visit within a certain period from discharge. For example, are racial differences in readmission and mortality rates related to differences in outpatient management? Asch et al. (2000) found that blacks and beneficiaries residing in medically underserved areas were less likely to have had a physician visit within four weeks of heart failure hospitalization. To the extent that a measure of severity of illness at admission can be developed from claims data, such information would be helpful in understanding variation in heart failure outcomes. Future studies could explore the relationship between length of stay (which varied widely by state) and readmission rates, and could also explore the role of readmission for conditions (such as pneumonia) that may be related to—but not coded as—heart failure.

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APPENDIX A

HEART FAILURE SPECIFICATIONS

Appendix A: Heart Failure Specifications

A. HEART FAILURE DISCHARGE RATES, LENGTH OF STAY, AND COST (M4)

Measure	Rate of heart failure discharges from short-stay hospitals
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.0, 428.1, and 428.9. The definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Numerator: *Discharge level:* Number of heart failure discharges *Beneficiary level:* Number of beneficiaries with at least one heart failure discharge Denominator: Number of beneficiaries in the population Rates are expressed in thousands.
Rationale	Description of heart failure utilization
Data Sources	MedPAR File Denominator File CMS Cross-Reference File

Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	Rates are age-sex–adjusted by using the Medicare Part A FFS population as of July 1, 1999, as the standard population. National results are standardized with 18 age/sex groups using direct standardization. State results are standardized using indirect standardization due to smaller sample sizes. Both methods are described in Anderson et al. (1998).
Period	1992–2001

Stratifiers	**Age** (0–54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94, 95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the beneficiary's residence on March 31 of the year following the reference year **State** of the beneficiary's residence on March 31 of the year following the reference year * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.

Measure	Average length of stay per heart failure discharge in short-stay hospitals, measured in days
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.0, 428.1, and 428.9. The definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year who had at least one heart failure discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Numerator: Days per heart failure hospitalization, based on admission and discharge date, with a maximum of 90 Denominator: Number of beneficiaries in the population
Rationale	Description of heart failure utilization
Data Sources	MedPAR File Denominator File CMS Cross-Reference File
Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	Length of stay is age-sex–adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population.

	National results are standardized with 18 age/sex groups using direct standardization. State results are standardized using indirect standardization due to smaller sample sizes. Both methods are described in Anderson et al. (1998).
Period	1992–2001
Stratifiers	**Age** (0–54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94, 95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the provider state, based on the MedPAR provider ID **Census division** of the provider state, based on the MedPAR provider ID **State** of the provider state, based on the MedPAR provider ID * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.

Measure	Medicare and beneficiary payments for heart failure discharges
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01,

	404.11, 404.91, 428.0, 428.1, and 428.9. The definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year who had a heart failure discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Total Medicare payments: Sum of Medicare program payments for all heart failure discharges in the population Total beneficiary payments: Sum of beneficiary coinsurance and deductible payments for all heart failure discharges in the population Average Medicare payments per discharge: Numerator: Sum of Medicare payments for all heart failure discharges in the population Denominator: Number of heart failure discharges in the population
Rationale	Description of heart failure utilization
Data Sources	MedPAR File Denominator File CMS Cross-Reference File
Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	None

Period	1992–2001
Stratifiers	**Age** (0–54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94, 95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for beneficiary payments **Census division** of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for beneficiary payments **State** of the provider state, based on the MedPAR provider ID, for Medicare Payments, and of the beneficiary state, as of March 31 of the year following the reference year, for Beneficiary Payments * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.

Measure	Average number of discharges (all-cause and heart failure–specific) among beneficiaries with at least one heart failure discharge
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01,

	404.11, 404.91, 428.0, 428.1, and 428.9. The definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Beneficiaries eligible for Medicare in January of each calendar year, enrolled in Part A for the full year, and not enrolled in Medicare managed care at any point in the year who had a heart failure discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Numerator: *Heart failure:* Number of heart failure discharges in reference year *All-cause*: Number of all discharges in reference year Denominator: Number of beneficiaries in the population
Rationale	Description of heart failure utilization
Data Sources	MedPAR File Denominator File CMS Cross-Reference File
Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	None
Period	1992–2001
Stratifiers	**Age** (0–54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94,

	95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the beneficiary residence, as of March 31 of the year following the reference year **Census division** of the beneficiary residence, as of March 31 of the year following the reference year **State** of the beneficiary residence, as of March 31 of the year following the reference year * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.

B. SPECIFICATIONS FOR READMISSION RATES (M5)

Measure	Beneficiary and discharge-level readmission rates following heart failure discharges, by type of readmission (heart failure or all-cause) and by days from discharge (2, 7, 30, 180, 365, and 730)
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.0, 428.1, and 428.9. The definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Medicare beneficiaries eligible for Medicare in January of each calendar year and enrolled in Part A and FFS for the full calendar year who had a heart failure discharge. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Beneficiary: Numerator: Number of beneficiaries hospitalized for all causes/for heart failure within 2, 7, 30, 180, 365, or 730 days of first heart failure discharge in the reference year Denominator: Number of beneficiaries with at least one heart failure discharge Discharge: Numerator: Number of beneficiaries hospitalized for all causes/for heart failure within 2, 7, 30, 180, 365, or 730 days of each index heart failure discharge in the reference year Denominator: Number of heart failure discharges in the reference year Rates are expressed in thousands. Rates with numerators of 25 or less are suppressed in tables. Beneficiary rates use the first heart failure admission as the index admission; discharge rates use each heart failure admission as an index admission. Readmissions include same-day readmissions to the same facility. Maryland readmission rates may not be comparable to those in other states. Maryland is the only state with a waiver from the CMS's prospective payment system. Due to

	Maryland's all-payer system, transfers may have been counted as readmissions, inflating readmission rates, especially short-term rates. Rates do not include beneficiaries who entered managed care or died within the window follow-up period. Readmissions are classified by the state of the *index* admission provider state, regardless of where the readmission occurs.
Rationale	Description of heart failure outcomes
Data Sources	MedPAR File Denominator File CMS Cross-Reference File
Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	Rates are age-/sex-adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population. National results are standardized with 18 age/sex groups using direct standardization. State results are standardized using indirect standardization due to smaller sample sizes. Both methods are described in Anderson et al. (1998).
Period	1992–2001
Stratifiers	**Age** (0-54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94, 95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and

	with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the provider state, based on the MedPAR provider ID **Census division** of the provider state, based on the MedPAR provider ID **State** of the provider state, based on the MedPAR provider ID * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.

C. SPECIFICATIONS FOR MORTALITY RATES (M6)

Measure	Mortality rates among beneficiaries with a heart failure hospitalization
Case Definition	Heart failure discharges are defined as claims with a principal diagnosis code of 402.01, 402.11, 402.91, 404.01, 404.11, 404.91, 428.0, 428.1, and 428.9. This definition excludes patients with renal failure. Claims that reflect transfers (within one day) from acute-care, short-stay hospitals to other acute-care, short-stay hospitals were combined with the claim for the original hospital admission, using the diagnosis codes from the later admission.
Population	Medicare beneficiaries eligible for Medicare in January of each calendar year and enrolled in Part A and FFS for the full calendar year who had a heart failure hospitalization. Beneficiaries who died during the calendar year but who would have otherwise qualified are included.
Computation	Numerator: Number of beneficiaries who died during the inpatient stay or within 2, 30, 180, 365, or 730 days from the day of the first (index) admission for heart failure in the year Denominator: Number of beneficiaries in the population Rates are expressed in thousands. Rates with numerators of 25 or less are suppressed in tables. Rates do not include beneficiaries who switched to managed care within the window follow-up period.
Rationale	Description of heart failure outcomes
Data Sources	MedPAR File Denominator File CMS Cross-Reference File

Exclusions	Missing or invalid values for state, sex, race, Medicare status Discharges from all hospitals other than short-stay hospitals Duplicate records Discharges from stand-alone emergency rooms Discharges with invalid procedure codes Discharges for Medicare beneficiaries whose Health Insurance Claim Number (HICNO) does not have a match in CMS's Cross-Reference File Overlapping beneficiary acute-care, short-stay hospital claims
Adjustment	Rates are age-/sex-adjusted using the Medicare Part A FFS population as of July 1, 1999, as the standard population. National results are standardized with 18 age/sex groups using direct standardization. State results are standardized using indirect standardization due to smaller sample sizes. Both methods are described in Anderson et al. (1998).
Period	1992–2001

Stratifiers	**Age** (0–54, 55–64, 65–69, 70–74, 75–79, 80–84, 85–89, 90–94, 95+) on July 1 of the reference year **Race** (white, black, other) **Sex** **Reason for Medicare eligibility** (aged without ESRD, disabled without ESRD, ESRD) **Dual enrollment** defined as enrolled in Medicare Part A and with Medicaid buy-in at least one month during the calendar year.* **Urban/rural** based on the metropolitan statistical area (MSA) and Bureau of Economic Analysis (BEA) State and County Crosswalk File developed for the CMS Prospective Payment System. All counties in an MSA are designated as urban; all other counties are considered rural. **Census region** of the provider state, based on the MedPAR provider ID **Census division** of the provider state, based on the MedPAR provider ID **State** of the provider state, based on the MedPAR provider ID * The Medicare data do not record true dual-enrollment status but only whether a state Medicaid program pays the beneficiary's Medicare premiums, copayments, and deductibles. The payment of these Medicare expenses by Medicaid does not always translate into full Medicaid coverage. Nevertheless, the buy-in indicator in the Medicare data is a reasonably accurate indicator of beneficiary poverty.